

Lenovo Flex System x240 M5 Product Guide

Lenovo Press Product Guide

The Lenovo Flex System™ x240 M5 Compute Node is a high-performance server that offers enhanced security, efficiency, and reliability features to handle business-critical workloads. The blade server is based on the Intel Xeon E5-2600 v3 processors. It features up to 18 cores and uses new TruDDR4 Memory, which runs at speeds up to 2133 MHz.

Suggested uses: Database, virtualization, enterprise applications, collaboration and email, streaming media, web, HPC, and cloud applications.

Figure 1 shows the Flex System x240 M5 Compute Node.



Figure 1. Flex System x240 M5 Compute Node

Did you know?

The x240 M5 Compute Node uses TruDDR4 Memory DIMM technology, which offers higher clock speeds, faster data transfer rates, and runs at a lower voltage (1.2V). With DDR4 technology, memory DIMMs can now operate at speeds up to 2133 MHz, which provides lower latency times and enhanced computing power. The TruDDR4 Memory portfolio includes RDIMMs with advanced error correction for reliability, performance, and maximum memory capacity. In addition, TruDDR4 Memory supports memory performance that exceeds industry standards.

The x240 M5 Compute Node integrates leadership security and reliability. System x Trusted Platform Assurance, an exclusive set of System x features and practices, establishes a foolproof security foundation for your workloads. Enterprise-class data protection is provided with optional self-encrypting drives and simple, centralized key management through Security Key Lifecycle Management. Diagnostic tools facilitate reduced downtime and costs.

Key features

The Flex System x240 M5 Compute Node is a high-availability, scalable compute node that is optimized to support the next-generation microprocessor technology. It is ideally suited for medium and large businesses. This section describes the key features of the server.

Scalability and performance

The x240 M5 offers the following features to boost performance, improve scalability, and reduce costs:

- Improves productivity by offering superior system performance with up to 18-core processors, up to 45 MB of L3 cache, and up to 9.6 GT/s QPI interconnect links.
- Supports up to two processors, 36 cores, and 72 threads, which maximizes the concurrent execution of multi-threaded applications.
- Intelligent and adaptive system performance with energy efficient Intel Turbo Boost Technology allows CPU cores to run at maximum speeds during peak workloads by temporarily going beyond processor thermal design power (TDP).
- Intel Hyper-Threading Technology boosts performance for multithreaded applications by enabling simultaneous multithreading within each processor core, up to two threads per core.
- Intel Virtualization Technology integrates hardware-level virtualization hooks that allow operating system vendors to better use the hardware for virtualization workloads.
- Intel Advanced Vector Extensions 2.0 (AVX 2.0) enable acceleration of enterprise-class workloads, such as databases and enterprise resource planning.
- Up to 2133 MHz memory speeds with two DIMMs per channel that are running at 2133 MHz to help maximize system performance.
- Up to 1.5 TB of memory capacity with 64 GB load-reduced DIMMs (LRDIMMs)
- Optional support for high-performance PCIe-attached NVMe Flash Storage solid-state drives (SSDs) can significantly improve I/O performance.
- Supports the Storage Expansion Node, which provides another 12 hot-swap, 2.5-inch drive bays for local storage.
- Up to 32 virtual I/O ports per compute node with available 10 Gb Virtual Fabric Adapters, which offers the choice of Ethernet, iSCSI, or Fibre Channel over Ethernet (FCoE) connectivity.
- The x240 M5 offers PCI Express 3.0 I/O expansion capabilities that improve the theoretical maximum bandwidth by 60% (8 GT/s per link), compared with the previous generation of PCI Express 2.0.
- With Intel Integrated I/O Technology, the PCI Express 3.0 controller is integrated into the Intel Xeon processor E5 family. This integration helps to dramatically reduce I/O latency and increase overall system performance.
- Support for high-bandwidth I/O adapters, up to two in each x240 M5 Compute Node.
- Support for 10 Gb Ethernet, 16 Gb Fibre Channel, and FDR InfiniBand.
- Supports the PCIe Expansion Node for support for up to six more I/O adapters.
- High-speed USB 3.0 port for connectivity to external devices.

Availability and serviceability

The x240 M5 provides the following features to simplify serviceability and increase system up-time:

- Chipkill, memory mirroring, and memory rank sparing for redundancy if there is a non-correctable memory failure.
- Tool-less cover removal provides easy access to upgrades and serviceable parts, such as CPU, memory, and adapter cards.
- Hot-swap drives support integrated RAID 1 redundancy for data protection and greater system up-time.
- A light path diagnostics panel and individual light path LEDs to quickly lead the technician to failed (or failing) components. This feature simplifies servicing, speeds up problem resolution, and helps improve system availability.
- Predictive Failure Analysis (PFA), which detects when system components (such as processors, memory, and hard disk drives) operate outside of standard thresholds and generates pro-active alerts in advance of possible failure, which increases uptime.
- Solid-state drives (SSDs), which offer significantly better reliability than traditional mechanical HDDs for greater uptime.
- Built-in Integrated Management Module II (IMM2) continuously monitors system parameters, triggers alerts, and performs recovering actions if there is a failure to minimize downtime.
- Built-in diagnostics that uses Dynamic Systems Analysis (DSA) Preboot speeds up troubleshooting tasks to reduce service time.
- Three-year customer replaceable unit and on-site limited warranty; next business day 9x5. Optional service upgrades are available.

Manageability and security

The following powerful systems management features simplify the local and remote management of the x240 M5:

- The x240 M5 includes an IMM2 to monitor server availability and perform remote management.
- Integrated industry-standard Unified Extensible Firmware Interface (UEFI) enables improved setup, configuration, and updates, and simplifies error handling.
- Integrated Trusted Platform Module (TPM) 1.2 support enables advanced cryptographic functionality, such as digital signatures and remote attestation.
- System x Trusted Platform Assurance, an exclusive set of System x security features and practices, establishes a foolproof security foundation for workloads by delivering firmware that is securely built, tested, digitally signed, and verified before execution.
- The server offers enterprise-class data protection with optional self-encrypting drives and simple, centralized key management through Security Key Lifecycle Management.
- Industry-standard AES NI support for faster, stronger encryption.
- Integrates with the IBM® Flex System™ Manager for proactive systems management. It offers comprehensive systems management for the entire Flex System platform that helps to increase up-time, reduce costs, and improve productivity through advanced server management capabilities.
- Lenovo Fabric Manager simplifies deployment of infrastructure connections by managing network and storage address assignments.

- Intel Execute Disable Bit functionality can help prevent certain classes of malicious buffer overflow attacks when combined with a supporting operating system.
- Intel Trusted Execution Technology provides enhanced security through hardware-based resistance to malicious software attacks, which allows an application to run in its own isolated space that is protected from all other software that is running on a system.

Energy efficiency

The x240 M5 offers the following energy-efficiency features to save energy, reduce operational costs, increase energy availability, and contribute to the green environment:

- Component-sharing design of the Flex System chassis provides ultimate power and cooling savings.
- The Intel Xeon processor E5-2600 v3 product family offers significantly better performance over the E5-2600 v2 family while fitting into the same thermal design power (TDP) limits.
- Intel Intelligent Power Capability powers individual processor elements on and off as needed, which reduces power draw.
- Low-voltage Intel Xeon processors draw less energy to satisfy demands of power and thermally constrained data centers and telecommunication environments.
- Low-voltage 1.2 V DDR4 memory DIMMs use up to 20% less energy compared to 1.35 V DDR3 DIMMs.
- Solid state drives (SSDs) use as much as 80% less power than traditional spinning 2.5-inch HDDs.
- The x240 M5 uses hexagonal ventilation holes, which are a part of Calibrated Vecteded Cooling™ technology. Hexagonal holes can be grouped more densely than round holes, which provides more efficient airflow through the system.

Locations of key components and connectors

Figure 2 shows the front of the server.

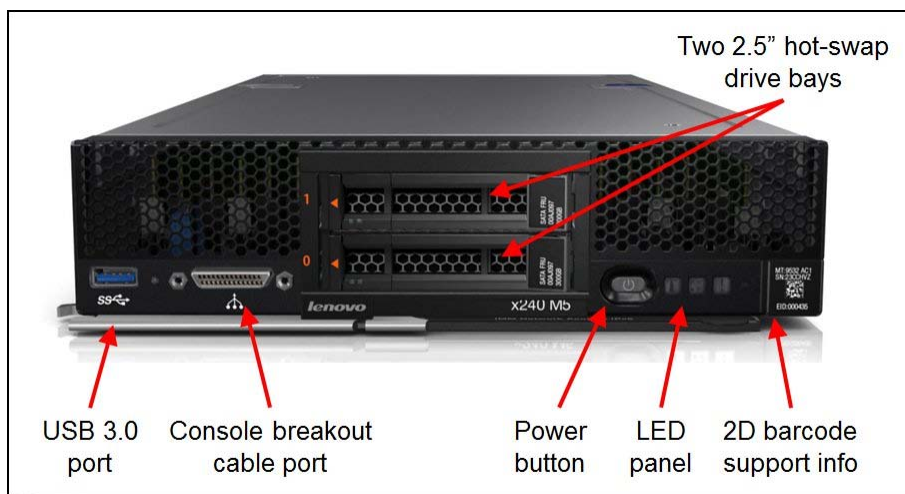


Figure 2. Front view of the Flex System x240 M5 Compute Node

Figure 3 shows the locations of key components inside the server.

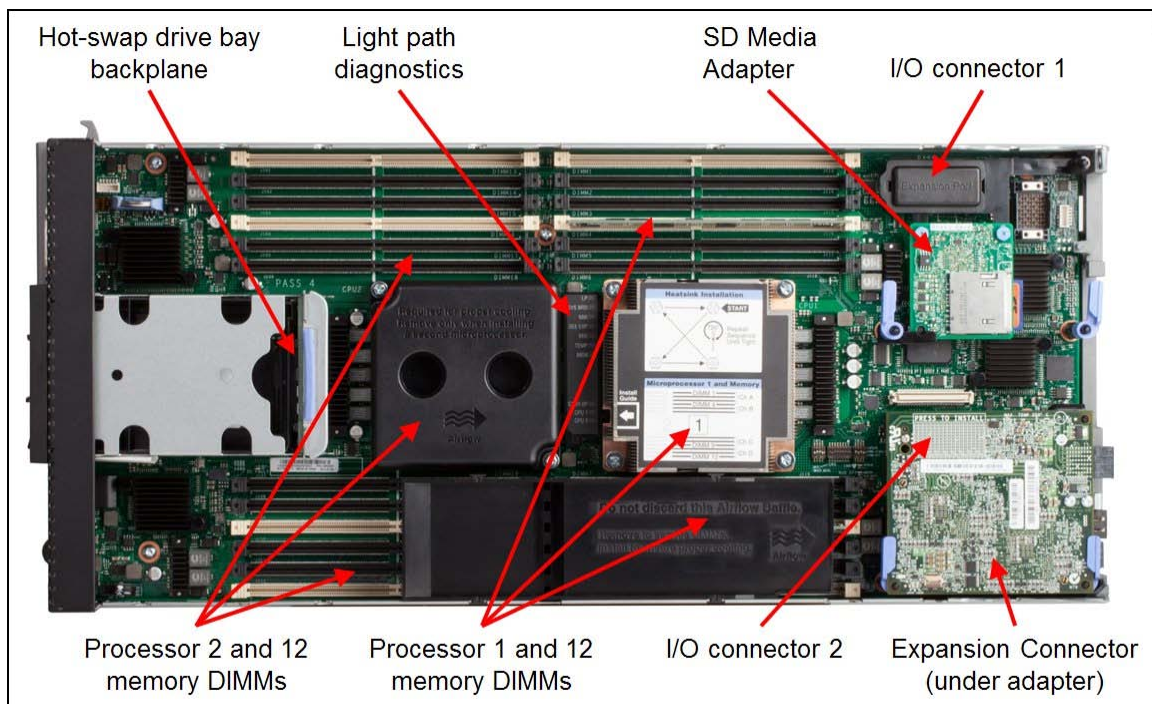


Figure 3. Inside view of the Flex System x240 M5 Compute Node

Standard specifications

The following table lists the standard specifications.

Table 1. Standard specifications (part 1)

Components	Specification
Models	9532-x2x, 9532-x4x, 9532-x6x
Firmware	Lenovo-signed firmware
Form factor	Standard-width compute node.
Chassis support	Flex System Enterprise Chassis.
Processor	Up to two Intel Xeon processor E5-2600 v3 product family CPUs with 18 cores (2.3 GHz), 16 cores (2.3 GHz), 14 cores (up to 2.6 GHz), 12 cores (up to 2.6 GHz) or 10 cores (up to 2.6 GHz), 8 cores (up to 3.2 GHz), 6 cores (up to 3.4 GHz), or up to 4 cores (up to 3.5 GHz). Two QPI links up to 9.6 GTps each. Up to 2133 MHz memory speed. Up to 45 MB L3 cache.
Chipset	Intel C612
Memory	Up to 24 DIMM sockets (12 DIMMs per processor). RDIMMs and LRDIMMs are supported. Memory types cannot be intermixed. Memory speed up to 2133 MHz. Four memory channels per processor (3 DIMMs per channel).
Memory maximums	With LRDIMMs: Up to 1.5 TB with 24x 64 GB LRDIMMs and two processors With RDIMMs: Up to 768 GB with 24x 32 GB RDIMMs and two processors
Memory protection	ECC, optional memory mirroring and memory rank sparing.
Disk drive bays	Two 2.5-inch hot-swap SAS/SATA drive bays that support SAS, SATA, and SSDs. Optional support for 2.5-inch NVMe Enterprise PCIe SSDs. Optional support for up to four 1.8-inch SSDs in place of the two 2.5-inch bays. Up to 12 more 2.5-inch drive bays with the optional Storage Expansion Node.
Maximum internal storage	With two 2.5-inch hot-swap drives: Up to 3.2 TB that uses 1.6 TB 2.5-inch SATA SSDs or up to 2.4 TB that uses 1.2 TB SAS HDDs. An intermix of SAS HDDs or SATA HDDs or SSDs is supported. With two 2.5-inch NVMe SSDs: Up to 4 TB that uses 2 TB NVMe 2.5-inch G3HS Enterprise Value PCIe SSDs. With four 1.8-inch SSDs: Up to 3.2 TB that uses 800 GB 1.8-inch SSDs. More storage is available with an attached Flex System Storage Expansion Node.
RAID support	RAID 0 and 1 with integrated LSI SAS3004 controller or optional ServeRAID M5215. Optional RAID 5 support with ServeRAID M1200 RAID 5 Enablement Kit and 1.8-inch SSDs
Network interfaces	x2x models: None standard; optional 1 Gb or 10 GbE adapters. x4x models: Two 10 GbE ports with EN4172 2-port 10Gb Ethernet Adapter. x6x models: Two 10 GbE ports with CN4052 2-port 10Gb Virtual Fabric Adapter.
PCI Expansion slots	Two I/O connectors for adapters. PCI Express 3.0 x16 interface. Includes an Expansion Connector (PCIe 3.0 x16) to connect an expansion node, such as the PCIe Expansion Node. PCIe Expansion Node supports two full-height PCIe adapters, two low-profile PCIe adapters, and two Flex System I/O adapters.
Ports	Front: One USB 3.0 port and one console breakout cable port that provides local KVM and serial ports (cable standard with chassis; more cables optional). Internal: Optional SD Media Adapter provides two SD Media slots for VMware vSphere hypervisor support (RAID 1 pair).

Table 1. Standard specifications (part 2)

Components	Specification
Systems management	UEFI, Integrated Management Module 2 (IMM2) with Renesas SH7758 controller, Predictive Failure Analysis, light path diagnostics panel, automatic server restart, remote presence. Support for Flex System Manager™, Systems Director and Active Energy Manager, Lenovo ToolsCenter.
Security features	Power-on password, administrator's password, Trusted Platform Module 1.2.
Video	Matrox G200eR2 video core with 16 MB video memory integrated into the IMM2. Maximum resolution is 1600x1200 at 75 Hz with 16 M colors.
Limited warranty	Three-year customer-replaceable unit and on-site limited warranty with 9x5/NBD.
Operating systems supported	Microsoft Windows Server 2012 and 2012 R2, Red Hat Enterprise Linux 6 and 7, SUSE Linux Enterprise Server 11, VMware vSphere 5.1 and 5.5. For more information, see "Supported operating systems."
Service and support	Optional service upgrades are available through Lenovo warranty services: 4-hour or 2-hour response time, 8-hour fix time, 1-year or 2-year warranty extension, remote technical support for Lenovo hardware and selected Lenovo and original equipment manufacturer (OEM) software.
Dimensions	Width: 215 mm (8.5 inches), height 51 mm (2.0 inches), depth 493 mm (19.4 inches).
Weight	Maximum configuration: 7.1 kg (15.6 lb).

The x240 M5 servers are shipped with the following items:

- Statement of Limited Warranty
- Important Notices
- Documentation CD that contains the *Installation and User's Guide*

Standard models

Table 2 lists the standard models.

Table 2. Standard models (Part 1)

Model	Intel Xeon Processor (2 maximum)*	Memory	Disk adapter	Disk bays† (used/max)	Disks	10 GbE	I/O slots (used / max)
Models with no Ethernet adapter standard							
9532-A2x	1x E5-2609 v3 6C 1.9GHz 15MB 1600MHz 85W	1x 16 GB (1600 MHz)	LSI SAS3004	2.5" hot-swap (0 / 2)	Open	Open	0 / 2
9532-B2x	1x E5-2620 v3 6C 2.4GHz 15MB 1866MHz 85W	1x 16 GB (1866 MHz)	LSI SAS3004	2.5" hot-swap (0 / 2)	Open	Open	0 / 2
9532-C2x	1x E5-2630 v3 8C 2.4GHz 20MB 1866MHz 85W	1x 16 GB (1866 MHz)	LSI SAS3004	2.5" hot-swap (0 / 2)	Open	Open	0 / 2
9532-D2x	1x E5-2640 v3 8C 2.6GHz 20MB 1866MHz 90W	1x 16 GB (1866 MHz)	LSI SAS3004	2.5" hot-swap (0 / 2)	Open	Open	0 / 2
9532-F2x	1x E5-2650L v3 12C 1.8GHz 30MB 2133MHz 65W	1x 16 GB 2133 MHz	LSI SAS3004	2.5" hot-swap (0 / 2)	Open	Open	0 / 2
9532-G2x	1x E5-2650 v3 10C 2.3GHz 25MB 2133MHz 105W	1x 16 GB 2133 MHz	LSI SAS3004	2.5" hot-swap (0 / 2)	Open	Open	0 / 2
9532-H2x	1x E5-2660 v3 10C 2.6GHz 25MB 2133MHz 105W	1x 16 GB 2133 MHz	LSI SAS3004	2.5" hot-swap (0 / 2)	Open	Open	0 / 2
9532-J2x	1x E5-2670 v3 12C 2.3GHz 30MB 2133MHz 120W	1x 16 GB 2133 MHz	LSI SAS3004	2.5" hot-swap (0 / 2)	Open	Open	0 / 2
9532-L2x	1x E5-2680 v3 12C 2.5GHz 30MB 2133MHz 120W	1x 16 GB 2133 MHz	LSI SAS3004	2.5" hot-swap (0 / 2)	Open	Open	0 / 2
9532-M2x	1x E5-2690 v3 12C 2.6GHz 30MB 2133MHz 135W	1x 16 GB 2133 MHz	LSI SAS3004	2.5" hot-swap (0 / 2)	Open	Open	0 / 2
9532-N2x	1x E5-2697 v3 14C 2.6GHz 35MB 2133MHz 145W	1x 16 GB 2133 MHz	LSI SAS3004	2.5" hot-swap (0 / 2)	Open	Open	0 / 2
9532-Q2x	1x E5-2698 v3 16C 2.3GHz 40MB 2133MHz 135W	1x 16 GB 2133 MHz	LSI SAS3004	2.5" hot-swap (0 / 2)	Open	Open	0 / 2
Models with EN4172 2-port 10Gb Ethernet Adapter standard							
9532-B4x	1x E5-2620 v3 6C 2.4GHz 15MB 1866MHz 85W	1x 16 GB (1866 MHz)	LSI SAS3004	2.5" hot-swap (0 / 2)	Open	2x 10 Gb	1 / 2
9532-D4x	1x E5-2640 v3 8C 2.6GHz 20MB 1866MHz 90W	1x 16 GB (1866 MHz)	LSI SAS3004	2.5" hot-swap (0 / 2)	Open	2x 10 Gb	1 / 2
9532-H4x	1x E5-2660 v3 10C 2.6GHz 25MB 2133MHz 105W	1x 16 GB 2133 MHz	LSI SAS3004	2.5" hot-swap (0 / 2)	Open	2x 10 Gb	1 / 2
9532-J4x	1x E5-2670 v3 12C 2.3GHz 30MB 2133MHz 120W	1x 16 GB 2133 MHz	LSI SAS3004	2.5" hot-swap (0 / 2)	Open	2x 10 Gb	1 / 2
9532-L4x	1x E5-2680 v3 12C 2.5GHz 30MB 2133MHz 120W	1x 16 GB 2133 MHz	LSI SAS3004	2.5" hot-swap (0 / 2)	Open	2x 10 Gb	1 / 2

* Processor detail: Processor quantity, model, cores, core speed, L3 cache, memory speed, power TDP rating.

† The two 2.5-inch drive bays can be replaced with four 1.8-inch SSD bays.

Table 2. Standard models (Part 2)

Model	Intel Xeon Processor (2 maximum)*	Memory	Disk adapter	Disk bays†	Disks	10 GbE‡	I/O slots
Models with CN4052 2-port 10Gb Virtual Fabric Adapter standard							
9532-B6x	1x E5-2620 v3 6C 2.4GHz 15MB 1866MHz 85W	1x 16 GB (1866 MHz)	LSI SAS3004	2.5" hot-swap (0 / 2)	Open	2x 10 Gb	1 / 2
9532-D6x	1x E5-2640 v3 8C 2.6GHz 20MB 1866MHz 90W	1x 16 GB (1866 MHz)	LSI SAS3004	2.5" hot-swap (0 / 2)	Open	2x 10 Gb	1 / 2
9532-H6x	1x E5-2660 v3 10C 2.6GHz 25MB 2133MHz 105W	1x 16 GB 2133 MHz	LSI SAS3004	2.5" hot-swap (0 / 2)	Open	2x 10 Gb	1 / 2
9532-J6x	1x E5-2670 v3 12C 2.3GHz 30MB 2133MHz 120W	1x 16 GB 2133 MHz	LSI SAS3004	2.5" hot-swap (0 / 2)	Open	2x 10 Gb	1 / 2
9532-L6x	1x E5-2680 v3 12C 2.5GHz 30MB 2133MHz 120W	1x 16 GB 2133 MHz	LSI SAS3004	2.5" hot-swap (0 / 2)	Open	2x 10 Gb	1 / 2

* Processor detail: Processor quantity, model, cores, core speed, L3 cache, memory speed, power TDP rating.

† The two 2.5-inch drive bays can be replaced with four 1.8-inch SSD bays.

TopSeller models

The following table lists the available TopSeller models.

Table 3. TopSeller models

Model	Intel Xeon Processor (2 maximum)*	Memory	Disk adapter	Disk bays†	Disks	10 GbE‡	I/O slots
TopSeller models - North America							
9532-E1x	2x E5-2620 v3 6C 2.4GHz 15MB 1866MHz 85W	2x 16 GB (1866 MHz)	LSI SAS3004	2.5" hot-swap (0 / 2)	Open	CN4022	1 / 2
9532-E2x	2x E5-2640 v3 8C 2.6GHz 20MB 1866MHz 90W	4x 16 GB (1866 MHz)	LSI SAS3004	2.5" hot-swap (0 / 2)	Open	CN4022	1 / 2
9532-E3x	2x E5-2650 v3 10C 2.3GHz 25MB 2133MHz 105W	4x 16 GB 2133 MHz	LSI SAS3004	2.5" hot-swap (0 / 2)	Open	CN4022	1 / 2
9532-E4x	2x E5-2670 v3 12C 2.3GHz 30MB 2133MHz 120W	8x 16 GB 2133 MHz	LSI SAS3004	2.5" hot-swap (0 / 2)	Open	CN4022	1 / 2
9532-E5x	2x E5-2690 v3 12C 2.6GHz 30MB 2133MHz 135W	8x 16 GB 2133 MHz	LSI SAS3004	2.5" hot-swap (0 / 2)	Open	CN4022	1 / 2

* Processor detail: Processor quantity, model, cores, core speed, L3 cache, memory speed, power TDP rating.

† The two 2.5-inch drive bays can be replaced with four 1.8-inch SSD bays.

‡ Models come standard with a CN4022 2-port 10Gb Converged Adapter

Chassis support

The x240 M5 Compute Node is supported in the Flex System chassis as listed in the following table.

Table 4. Chassis support

Chassis models	Description	Supports x240 M5 (9532)
8721-HC1 based: 8721-A1x, LRx, DCx 8721-K1G, E1Y, E2Y	Lenovo Flex System Enterprise Chassis with CMM (68Y7030) standard	Yes
8721-HC2 based: 8721-ALx, DLx 8721-E3Y, E4Y	Lenovo Flex System Enterprise Chassis with CMM2 (00FJ669) standard	Yes

Up to 14 x240 M5 Compute Nodes can be installed in the chassis; however, the actual number that can be installed in a chassis depends on the following factors:

- TDP power rating for the processors that are installed in the x240 M5
- Number of power supplies that are installed in the chassis
- Capacity of the installed power supplies (2100 W or 2500 W)
- Chassis power redundancy policy that is used (N+1 or N+N)

The following table provides guidelines about what number of x240 M5 Compute Nodes can be installed. For more information, use the Power Configurator, which is found at the following website:

<http://ibm.com/systems/bladecenter/resources/powerconfig.html>

The following color coding was used In the table:

- Green = No restriction on the number of x240 M5 Compute Nodes that can be installed
- Yellow = Some bays must be left empty in the chassis

Table 5. Maximum number of x240 M5 Compute Nodes that can be installed based on installed power supplies and power redundancy policy used

x240 M5 TDP rating	2100 W power supplies installed				2500 W power supplies installed			
	N+1, N=5 6 power supplies	N+1, N=4 5 power supplies	N+1, N=3 5 power supplies	N+N, N=3 6 power supplies	N+1, N=5 6 power supplies	N+1, N=4 5 power supplies	N+1, N=3 4 power supplies	N+N, N=3 6 power supplies
52 W	14	14	11	11	14	14	14	14
55 W	14	14	11	11	14	14	14	14
65 W	14	14	11	11	14	14	14	14
75 W	14	14	11	11	14	14	14	14
85 W	14	14	11	11	14	14	14	14
90 W	14	14	11	11	14	14	14	14
105 W	14	14	11	11	14	14	13	14
120 W	14	14	11	11	14	14	13	14
135 W	14	13	11	11	14	14	12	13
145 W	14	13	11	11	14	14	12	13

Processor options

The x240 M5 supports the processor options that are listed in the following table. The server supports one or two processors. The table also shows which server models have each processor standard, if any.

Table 6. Processor options

Part number	Feature code*	Intel Xeon processor description	Models where used
00JX063	A5T1 / A5SJ	Intel Xeon E5-2603 v3 6C 1.6GHz 15MB 1600MHz 85W	-
00KJ052	AS35 / AS3F	Intel Xeon E5-2608L v3 6C 2.0GHz 15MB 1866MHz 52W	-
00JX062	A5T2 / A5SK	Intel Xeon E5-2609 v3 6C 1.9GHz 15MB 1600MHz 85W	A2x
00KJ051	AS34 / AS3E	Intel Xeon E5-2618L v3 8C 2.3GHz 20MB 1866MHz 75W	-
00JX060	A5T3 / A5SL	Intel Xeon E5-2620 v3 6C 2.4GHz 15MB 1866MHz 85W	B2x, B4x, B6x
00KJ048	AS31 / AS3B	Intel Xeon E5-2623 v3 4C 3.0GHz 10MB 1866MHz 105W	-
00KJ050	AS33 / AS3D	Intel Xeon E5-2628L v3 10C 2.0GHz 25MB 1866MHz 75W	-
00JX059	A5T5 / A5SN	Intel Xeon E5-2630 v3 8C 2.4GHz 20MB 1866MHz 85W	C2x
00JX061	A5T4 / A5SM	Intel Xeon E5-2630L v3 8C 1.8GHz 20MB 1866MHz 55W	-
00JX066	A5T6 / A5SP	Intel Xeon E5-2637 v3 4C 3.5GHz 15MB 2133MHz 135W	-
00JX058	A5T7 / A5SQ	Intel Xeon E5-2640 v3 8C 2.6GHz 20MB 1866MHz 90W	D2x, D4x, D6x
00JX065	A5T8 / A5SR	Intel Xeon E5-2643 v3 6C 3.4GHz 20MB 2133MHz 135W	-
00KJ049	AS32 / AS3C	Intel Xeon E5-2648L v3 12C 1.8GHz 30MB 2133MHz 75W	-
00JX056	A5TA / A5ST	Intel Xeon E5-2650 v3 10C 2.3GHz 25MB 2133MHz 105W	G2x
00JX057	A5T9 / A5SS	Intel Xeon E5-2650L v3 12C 1.8GHz 30MB 2133MHz 65W	F2x
00KJ044	AS2X / AS37	Intel Xeon E5-2658 v3 12C 2.2GHz 30MB 2133MHz 105W	-
00JX055	A5TB / A5SU	Intel Xeon E5-2660 v3 10C 2.6GHz 25MB 2133MHz 105W	H2x, H4x, H6x
00JX064	A5TC / A5SV	Intel Xeon E5-2667 v3 8C 3.2GHz 20MB 2133MHz 135W	-
00JX054	A5TD / A5SW	Intel Xeon E5-2670 v3 12C 2.3GHz 30MB 2133MHz 120W	J2x, J4x, J6x
00JX053	A5TE / A5SX	Intel Xeon E5-2680 v3 12C 2.5GHz 30MB 2133MHz 120W	L2x, L4x, L6x
00KJ047	AS30 / AS3A	Intel Xeon E5-2683 v3 14C 2.0GHz 35MB 2133MHz 120W	-
00KJ046	AS2Z / AS39	Intel Xeon E5-2685 v3 12C 2.6GHz 30MB 2133MHz 120W	-
00JX052	A5TF / A5SY	Intel Xeon E5-2690 v3 12C 2.6GHz 30MB 2133MHz 135W	M2x
00JX051	A5TG / A5SZ	Intel Xeon E5-2695 v3 14C 2.3GHz 35MB 2133MHz 120W	-
00JX050	A5TH / A5T0	Intel Xeon E5-2697 v3 14C 2.6GHz 35MB 2133MHz 145W	N2x
00KJ045	AS2Y / AS38	Intel Xeon E5-2698 v3 16C 2.3GHz 40MB 2133MHz 135W	Q2x
00KJ043	AS2W / AS36	Intel Xeon E5-2699 v3 18C 2.3GHz 45MB 2133MHz 145W	-

* The first feature code is for processor 1 and second feature code is for processor 2.

Memory options

TruDDR4 Memory uses the highest quality components that are sourced from Tier 1 DRAM suppliers and only memory that meets the strict requirements of Lenovo is selected. It is compatibility tested and tuned on every System x server to maximize performance and reliability. TruDDR4 Memory has a unique signature that is programmed into the DIMM that enables System x servers to verify whether the memory that is installed is qualified or supported by Lenovo. Because TruDDR4 Memory is authenticated, certain extended memory performance features can be enabled to extend performance over industry standards. From a service and support standpoint, Lenovo memory automatically assumes the Lenovo system warranty and Lenovo provides service and support worldwide.

The following table lists the supported memory options.

Table 7. Memory options for the x240 M5

Part number	Feature code	Description	Models where used
Registered DIMMs (RDIMMs)			
46W0784	A5B6	4GB TruDDR4 Memory (1Rx8, 1.2V) PC4-17000 CL15 2133MHz LP RDIMM	-
46W0788	A5B5	8GB TruDDR4 Memory (1Rx4, 1.2V) PC4-17000 CL15 2133MHz LP RDIMM	-
46W0792	A5B8	8GB TruDDR4 Memory (2Rx8, 1.2V) PC4-17000 CL15 2133MHz LP RDIMM	-
95Y4821	ASD9	16GB TruDDR4 Memory (2Rx4, 1.2V) PC4-17000 CL15 2133MHz LP RDIMM	All models
95Y4808	A5UJ	32GB TruDDR4 Memory (2Rx4, 1.2V) PC4-17000 CL15 2133MHz LP RDIMM	-
Load-reduced DIMMs (LRDIMMs)			
46W0800	A5B9	32GB TruDDR4 Memory (4Rx4, 1.2V) PC4-17000 CL15 2133MHz LP LRDIMM	-
95Y4812	A5UK	64GB TruDDR4 Memory (4Rx4, 1.2V) PC4-17000 CL15 2133MHz LP LRDIMM	-

The server supports up to 12 TruDDR Memory DIMMs when one processor is installed and up to 24 DIMMs when two processors are installed. Each processor has four memory channels, and there are three DIMMs per memory channel (3 DPC). RDIMMs and LRDIMMs are supported, but the mixing of these different types is not supported. UDIMMs are not supported. DIMMs can be installed individually; however, install them in sets of four (one for each of the four memory channels) for performance reasons.

The following rules apply when the memory configuration is selected:

- Mixing of different types of DIMMs (RDIMM and LRDIMM) in the same server is not supported.
- The maximum number of supported ranks per channel is eight.
- The maximum quantity of DIMMs that can be installed in the server depends on the number of CPUs, DIMM rank and operating voltage, as shown in the "Maximum quantity" row in the following table. The shaded cells indicate that the DIMM type supports the maximum number of DIMMs (24 for the x240 M5).

- All DIMMs in all CPU memory channels operate at the same speed, which is determined as the lowest value of the following factors:
 - Memory speed that is supported by the specific CPU.
 - Lowest maximum operating speed for the selected memory configuration that depends on rated speed, as shown in the "Maximum operating speed" section in the following table. The shaded cells indicate that the speed indicated is the maximum that the DIMM allows.

The following table shows the maximum memory speeds that are achievable based on the installed DIMMs and the number of DIMMs per channel. The table also shows the maximum memory capacity at any speed that is supported by the DIMM and maximum memory capacity at rated DIMM speed. In the table, cells that are highlighted in gray indicate when the specific combination of DIMM voltage and number of DIMMs per channel still allows the DIMMs to operate at the rated speed.

Table 8. Maximum memory speeds

Specification	RDIMMs		LRDIMMs
Rank	Single rank	Dual rank	Quad rank
Part numbers	46W0784 (4 GB) 46W0788 (8 GB)	46W0792 (8 GB) 95Y4821 (16 GB) 95Y4808 (32 GB)	46W0800 (32 GB) 1600 MHz / 1866 MHz†
Rated speed	2133 MHz	2133 MHz	2133 MHz
Rated voltage	1.2 V	1.2 V	1.2 V
Operating voltage	1.2 V	1.2 V	1.2 V
Maximum quantity*	24	24	24
Largest DIMM	8 GB	16 GB	64 GB
Max memory capacity	192 GB	384 GB	1.5 TB
Max memory at rated speed	128 GB	256 GB	1.0 TB
Maximum operating speed (MHz)			
One DIMM per channel	2133 MHz	2133 MHz	2133 MHz
Two DIMMs per channel	2133 MHz	2133 MHz	2133 MHz
Three DIMMs per channel	1600 MHz	1600 MHz	1866 MHz

* The maximum quantity that is supported is shown for two processors that are installed. When one processor is installed, the maximum quantity that is supported is half of that shown.

† At 3 DIMMs per channel, the 8 GB DIMM operates at 1600 MHz and the 16 GB DIMM operates at 1866 MHz.

The following memory protection technologies are supported:

- ECC
- Memory mirroring
- Memory sparing

If memory mirroring is used, DIMMs must be installed in pairs (minimum of one pair per CPU), and both DIMMs in a pair must be identical in type and size.

If memory rank sparing is used, a minimum of one quad-rank DIMM or two single-rank or dual-rank DIMMs must be installed per populated channel (the DIMMs do not need to be identical). In rank sparing mode, one rank of a DIMM in each populated channel is reserved as spare memory. The size of a rank varies depending on the DIMMs that are installed.

Internal storage

The x240 M5 server has two 2.5-inch hot-swap drive bays that are accessible from the front of the blade server (see Figure 2). These bays connect to the integrated LSI SAS3004 12 Gbps SAS/SATA RAID-on-Chip (ROC) controller.

The integrated LSI SAS3004 ROC has the following features:

- Four-port LSI SAS3004 controller with 12 Gbps throughput per port
- PCIe x4 Gen 2 host interface
- Two SAS ports routed internally to the two hot-swap drive bays
- Supports RAID-0, RAID-1 and RAID-1E

The onboard controller optionally supports self-encrypting drives (SEDs) with the addition of Features on Demand license upgrade, ServeRAID M1200 Series Zero Cache/RAID 5 Upgrade, 00AE930. This license upgrade enables the LSI MegaRAID SafeStore service which offers instant secure erase and local key management for SEDs.

The two 2.5-inch front-accessible drive bays can be replaced with four 1.8-inch drive bays, two 1.8-inch bays replacing each 2.5-inch bay, by using the ServeRAID M1200 RAID 5 Enablement Kit, 00JX141. This kit contains a replacement backplane to connect the four 1.8-inch SSDs. The kit also includes ServeRAID M1200 Zero Cache/RAID 5 Upgrade (Feature on Demand license), which adds RAID 5 support.

The two standard 2.5-inch SAS/SATA drive bays can also be replaced with new PCIe NVMe (Non-Volatile Memory Express) drives that are directly connected to the PCIe bus of the second processor. Such connectivity, when combined with SSD drives, ensures the lowest possible latency while still using a standard drive form factor.

Support for NVMe drives requires a replacement drive backplane for the two 2.5-inch drives plus the second processor must also be installed in the server. The kit containing the backplane, NVMe Enterprise PCIe SSD Enablement Kit for Flex System x240 M5, is listed in the following table.

Table 9. Internal storage upgrades

Part number	Feature code	Name and description	Maximum supported
00AE930	A5H5	ServeRAID M1200 Series Zero Cache/RAID 5 Upgrade for Systems-FoD	1
00JX141	A5SF	ServeRAID M1200 RAID 5 Enablement Kit for Flex System x240 M5	1
00JX177	A5SH	NVMe Enterprise PCIe SSD Enablement Kit for Flex System x240 M5	1
00JX142	A5SE	ServeRAID M5215 with 2GB Flash Enablement - Flex System x240 M5	1

Supported drives are listed in the "Internal drive options" section. The ServeRAID M5215 is described in the next section.

ServeRAID M5215 SAS/SATA controller

The ServeRAID M5215 SAS/SATA controller is an advanced RAID controller based on the LSI SAS 3108 chipset. The M5215 replaces the onboard SAS controller in the compute node and supports high-performance RAID-0 and RAID-1 to the two internal 2.5-inch drive bays. The M5215 is installed at the front of the server over the top of the drive bays, as shown in the following figure.

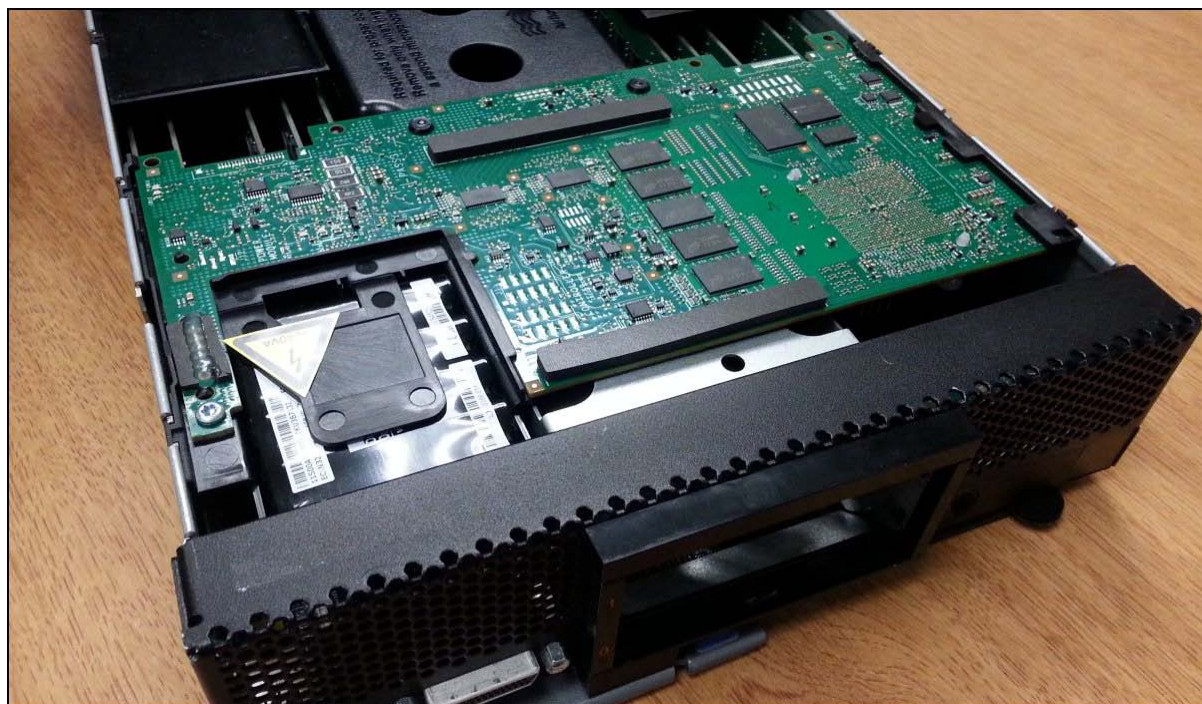


Figure 4. ServeRAID M5215 SAS/SATA controller installed in the Flex System x240 M5

The part numbers to order the ServeRAID M5215 controller and feature upgrade are listed in the following table.

Table 10. ServeRAID M5215 SAS/SATA controller

Part number	Feature code	Name and description	Maximum supported
Adapter			
00JX142	A5SE	ServeRAID M5215 with 2GB Flash Enablement	1
Feature on Demand upgrades			
47C8710	A3Z7	ServeRAID M5200 Series Performance Accelerator for FoD (MegaRAID FastPath)	1

The ServeRAID M5215 option includes the following components:

- RAID controller
- Flash power module
- Replacement 2-drive backplane

The following figure shows the adapter, flash power module and backplane that are included in the option. The included backplane replaces the standard backplane that came with the server. The backplane also serves as the conduit to route the PCIe signals from the system board to the RAID controller.

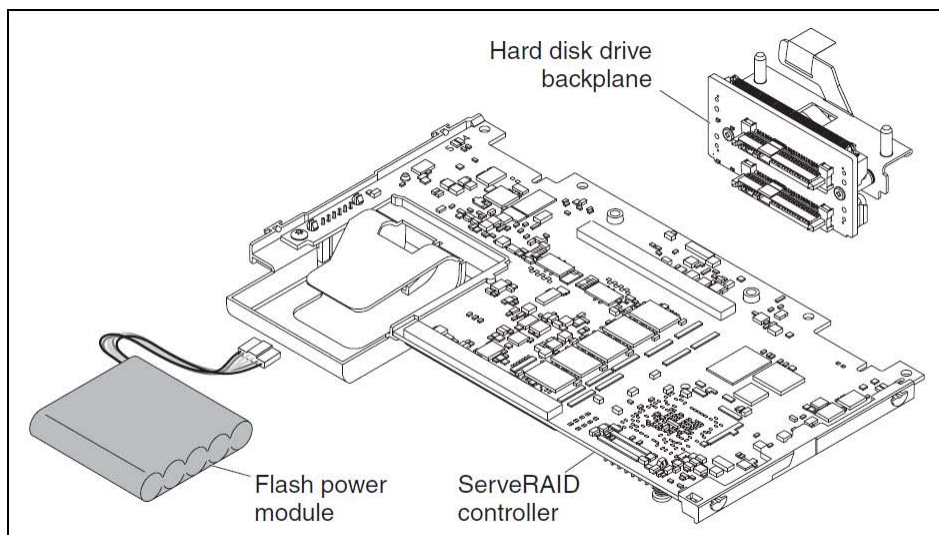


Figure 5. ServeRAID M5215 SAS/SATA controller

Note: The ServeRAID M5215 installed in the x240 M5 only supports two 2.5-inch drives using the supplied backplane. 1.8-inch drives are not supported.

The ServeRAID M5215 SAS/SATA controller has the following features:

- Eight internal 12 Gbps SAS/SATA ports (also supports 6 Gbps)
- PCI Express 3.0 x8 host interface
- 12 Gbps throughput per port
- LSI SAS3108 12 Gbps RAID on Chip (ROC) controller
- Onboard 2 GB data cache (DDR3 running at 1866 MHz)
- Support for RAID levels 0 and 1
- Standard flash power module (supercapacitor-based) provides the power capacity needed to off-load the cache to flash in the event of a power failure
- Support SAS and SATA HDDs and SSDs
- Support for intermixing SAS and SATA HDDs and SSDs; mixing different types of drives in the same array (drive group) is not recommended
- Support for self-encrypting drives, SEDs (LSI MegaRAID SafeStore)
- Optional support for SSD performance acceleration with MegaRAID FastPath
- Support for up to 64 virtual disks, up to 128 arrays, and up to 16 virtual disks per array
- Support for logical unit number (LUN) sizes up to 64 TB
- Configurable stripe size up to 1 MB
- Compliant with Disk Data Format (DDF) configuration on disk (COD)
- S.M.A.R.T. support
- MegaRAID Storage Manager management software

The Performance Accelerator upgrade (47C8710), implemented using the LSI MegaRAID FastPath software, provides high-performance I/O acceleration for SSD-based virtual drives by using an extremely low-latency I/O path to increase the maximum I/O per second (IOPS) capability of the controller. This feature boosts the performance of applications with a highly random data storage access pattern, such as transactional databases. Part number 47C8710 is a Feature on Demand license.

Internal drive options

The 2.5-inch drive bays support SAS or SATA HDDs or SATA SSDs. The following table lists the supported 2.5-inch drive options.

Table 11. 2.5-inch drive options for internal disk storage (Part 1)

Part number	Feature code	Description	Maximum supported
6 Gb 10K SAS hard disk drives			
00AJ096	A4TL	300GB 10K 6Gbps SAS 2.5-inch G3HS HDD	2
00AJ091	A4TM	600GB 10K 6Gbps SAS 2.5-inch G3HS HDD	2
00AJ071	A4TN	900GB 10K 6Gbps SAS 2.5-inch G3HS HDD	2
00AJ146	A4TP	1.2TB 10K 6Gbps SAS 2.5-inch G3HS HDD	2
6 Gb 15K SAS hard disk drives			
00AJ111	A4TQ	146GB 15K 6Gbps SAS 2.5-inch G3HS HDD	2
00AJ081	A4TR	300GB 15K 6Gbps SAS 2.5-inch G3HS HDD	2
00AJ126	A4TS	600GB 15K 6Gbps SAS 2.5-inch G3HS HDD	2
6 Gb 10K and 15K self-encrypting disk drives (SED HDDs)			
00AJ106	A4TY	300GB 10K 6Gbps SAS 2.5-inch G3HS SED	2
00AJ101	A4TZ	600GB 10K 6Gbps SAS 2.5-inch G3HS SED	2
00AJ076	A4U0	900GB 10K 6Gbps SAS 2.5-inch G3HS SED	2
00AJ151	A4U1	1.2TB 10K 6Gbps SAS 2.5-inch G3HS SED	2
00AJ116	A4U2	146GB 15K 6Gbps SAS 2.5-inch G3HS SED	2
6 Gb NL SAS			
00AJ121	A4TT	500GB 7.2K 6Gbps NL SAS 2.5-inch G3HS HDD	2
00AJ086	A4TU	1TB 7.2K 6Gbps NL SAS 2.5-inch G3HS HDD	2
6 Gb NL SATA			
00AJ131	A4TV	250GB 7.2K 6Gbps NL SATA 2.5-inch G3HS HDD	2
00AJ136	A4TW	500GB 7.2K 6Gbps NL SATA 2.5-inch G3HS HDD	2
00AJ141	A4TX	1TB 7.2K 6Gbps NL SATA 2.5-inch G3HS HDD	2

Table 11. 2.5-inch drive options for internal disk storage (Part 2)

Part number	Feature code	Description	Maximum supported
6 Gb solid-state drives - Enterprise			
00AJ212	A4UB	400GB SAS 2.5-inch MLC G3HS Enterprise SSD	2
00AJ217	A4UC	800GB SAS 2.5-inch MLC G3HS Enterprise SSD	2
00AJ222	A4UD	1.6TB SAS 2.5-inch MLC G3HS Enterprise SSD	2
00AJ156	A4U3	S3700 200GB SATA 2.5-inch MLC G3HS Enterprise SSD	2
00AJ161	A4U4	S3700 400GB SATA 2.5-inch MLC G3HS Enterprise SSD	2
00AJ166	A4U5	S3700 800GB SATA 2.5-inch MLC G3HS Enterprise SSD	2
6 Gb solid-state drives - Enterprise Value			
00AJ395	A577	120GB SATA 2.5-inch MLC G3HS Enterprise Value SSD	2
00AJ400	A578	240GB SATA 2.5-inch MLC G3HS Enterprise Value SSD	2
00AJ405	A579	480GB SATA 2.5-inch MLC G3HS Enterprise Value SSD	2
00AJ410	A57A	800GB SATA 2.5-inch MLC G3HS Enterprise Value SSD	2
12 Gb 15K SAS hard disk drives			
00NA221	ASBB	300GB 15K 12Gbps SAS 2.5" G3HS 512e HDD	2
00NA231	ASBD	600GB 15K 12Gbps SAS 2.5" G3HS 512e HDD	2
12 Gb 10K SAS hard disk drives			
00NA241	ASBF	600GB 10K 12Gbps SAS 2.5" G3HS 512e HDD	2
00NA251	ASBH	900GB 10K 12Gbps SAS 2.5" G3HS 512e HDD	2
00NA261	ASBK	1.2TB 10K 12Gbps SAS 2.5" G3HS 512e HDD	2
00NA271	ASBM	1.8TB 10K 12Gbps SAS 2.5" G3HS 512e HDD	2
12 Gb 15K self-encrypting disk drives (SED HDDs)			
00NA281	ASBP	300GB 15K 12Gbps SAS 2.5" G3HS 512e SED	2
00NA286	ASBQ	600GB 15K 12Gbps SAS 2.5" G3HS 512e SED	2
12 Gb 10K self-encrypting disk drives (SED HDDs)			
00NA291	ASBR	600GB 10K 12Gbps SAS 2.5" G3HS 512e SED	2
00NA296	ASBS	900GB 10K 12Gbps SAS 2.5" G3HS 512e SED	2
00NA301	ASBT	1.2TB 10K 12Gbps SAS 2.5" G3HS 512e SED	2
00NA306	ASBU	1.8TB 10K 12Gbps SAS 2.5" G3HS 512e SED	2
12 Gb SAS-SSD hybrid drives			
00NA311	ASBV	300GB 15K 12Gbps SAS 2.5" G3HS 512e Hybrid	2
00NA321	ASBX	600GB 15K 12Gbps SAS 2.5" G3HS 512e Hybrid	2

Table 11. 2.5-inch drive options for internal disk storage (Part 3)

Part number	Feature code	Description	Maximum supported
12 Gb solid-state drives - Enterprise			
00FN379	AS7C	200GB 12G SAS 2.5-inch MLC G3HS Enterprise SSD	2
00FN389	AS7E	400GB 12G SAS 2.5-inch MLC G3HS Enterprise SSD	2
00FN399	AS7G	800GB 12G SAS 2.5-inch MLC G3HS Enterprise SSD	2
00FN409	AS7J	1.6TB 12G SAS 2.5-inch MLC G3HS Enterprise SSD	2
12 Gb SED solid-state drives - Enterprise			
00FN419	AS7L	400GB SED 12G SAS 2.5-inch MLC G3HS Enterprise SSD	2
00FN424	AS7M	800GB SED 12G SAS 2.5-inch MLC G3HS Enterprise SSD	2
PCIe NVMe solid-state drives			
90Y3227	A5RW	P3600 400GB NVMe 2.5-inch G3HS Enterprise Value PCIe SSD	2
90Y3230	A5RX	P3600 800GB NVMe 2.5-inch G3HS Enterprise Value PCIe SSD	2
90Y3233	A5RY	P3600 1.6TB NVMe 2.5-inch G3HS Enterprise Value PCIe SSD	2
90Y3236	A5RZ	P3600 2.0TB NVMe 2.5-inch G3HS Enterprise Value PCIe SSD	2

The supported 1.8-inch SSDs are listed in the following table. The use of 1.8-inch drives requires the ServeRAID M1200 RAID 5 Enablement Kit, 00JX141. The ServeRAID M5215 is not supported.

Table 12. Supported 1.8-inch SSDs

Part number	Feature code	Description	Maximum supported
Enterprise SSDs			
41Y8366	A4FS	S3700 200GB SATA 1.8-inch MLC Enterprise SSD	4
41Y8371	A4FT	S3700 400GB SATA 1.8-inch MLC Enterprise SSD	4
Enterprise Value SSDs			
00AJ040	A4KV	S3500 80GB SATA 1.8-inch MLC Enterprise Value SSD	4
00AJ045	A4KW	S3500 240GB SATA 1.8-inch MLC Enterprise Value SSD	4
00AJ050	A4KX	S3500 400GB SATA 1.8-inch MLC Enterprise Value SSD	4
00AJ455	A58U	S3500 800GB SATA 1.8-inch MLC Enterprise Value SSD	4
00AJ335	A56V	120GB SATA 1.8-inch MLC Enterprise Value SSD	4
00AJ340	A56W	240GB SATA 1.8-inch MLC Enterprise Value SSD	4
00AJ345	A56X	480GB SATA 1.8-inch MLC Enterprise Value SSD	4
00AJ350	A56Y	800GB SATA 1.8-inch MLC Enterprise Value SSD	4

Flex System Storage Expansion Node

The x240 M5 supports the attachment of the Flex System Storage Expansion Node. The Flex System Storage Expansion Node provides the ability to attach another 12 hot-swap 2.5-inch HDDs or SSDs locally to the attached compute node. The Storage Expansion Node provides storage capacity for Network Attach Storage (NAS) workloads, which provides flexible storage to match capacity, performance, and reliability needs.

The following figure shows the Flex System Storage Expansion Node attached to a compute node.



Figure 6. Flex System Storage Expansion Node (right) attached to the x240 M5 (left)

The ordering information for the Storage Expansion Node is shown in the following table.

Table 13. Ordering part number and feature code

Part number	Feature code	Description	Maximum supported
68Y8588	A3JF	Flex System Storage Expansion Node	1

The Storage Expansion Node has the following features:

- Connects directly to supported compute nodes via a PCIe 3.0 interface to the compute node's expansion connector (see Figure 3).
- Supports 12 hot-swap 2.5-inch drive, accessible via a sliding tray.
- Supports 6 Gbps SAS and SATA drives, both HDDs and SSDs.
- Based on an LSI SAS2208 6 Gbps RAID on Chip (ROC) controller.
- Supports RAID 0, 1, 5, 10, and 50 as standard. JBOD also supported. Optional RAID 6 and 60 with a Features on Demand upgrade.
- Optional 512 MB or 1 GB cache with cache-to-flash super capacitor offload.

Note: The use of the Storage Expansion Node requires that the x240 M5 Compute Node have both processors installed.

For more information, see the Lenovo Press Product Guide: <http://lenovopress.com/tips0914>

Internal tape drives

The server does not support an internal tape drive. However, it can be attached to external tape drives by using Fibre Channel connectivity.

Optical drives

The server does not support an internal optical drive option, however, you can connect an external USB optical drive. See <http://support.lenovo.com/en/documents/pd011281> for information about available external optical drives from Lenovo. Alternatively, use the remote media feature of the IMMv2 and the Chassis Management Module.

Note: The USB port on the compute nodes supplies up to 0.5 A at 5 V. For devices that require more power, another power source is required.

EN4172 2-port 10Gb Ethernet Adapter

Some models of the x240 M5 (those with a model of the form 9532-x4x) include the Flex System EN4172 2-port 10Gb Ethernet Adapter installed in slot 1. Table 2 lists the models with this adapter standard. These models require that a compatible Ethernet switch be installed in I/O module bays 1 and 2 of the chassis.

The EN4172 2-port 10Gb Ethernet Adapter includes the following features:

- Two-port 10 Gb Ethernet adapter
- Single ASIC controller that uses the QLogic BCM57840 ASIC
- PCI Express 3.0 x8 host interface
- B and 10 Gb auto-negotiation)
- Full line-rate performance
- Supports vNIC - Switch Independent Mode

For more information about this adapter, see the Lenovo Press Product Guide, available from: <http://lenovopress.com/tips1087>

CN4052 2-port 10Gb Virtual Fabric Adapter

Some models of the x240 M5 (those with a model of the form 9532-x6x) include the Flex System CN4052 2-port 10Gb Virtual Fabric Adapter installed in slot 1. Table 2 lists the models with this adapter standard. These models require that a compatible Ethernet switch be installed in I/O module bays 1 and 2 of the chassis.

The CN4052 2-port 10Gb Virtual Fabric Adapter includes the following features:

- Two-port 10 Gb Ethernet adapter.
- Optional support for FCoE and iSCSI via an Features on Demand license upgrade.
- Single ASIC controller that uses the Emulex XE104 design.
- PCIe Express 3.0 x8 host interface (8 GT/s).
- Connection to 1 Gb or 10 Gb data center infrastructure (1 Gb and 10 Gb auto-negotiation) .
- Full line-rate performance.
- Supports NIC virtualization (vNIC) up to four virtual ports per physical port. Supports Virtual Fabric Mode, Switch Independent Mode, and Unified Fabric Port Mode.

For more information about this adapter, see the Lenovo Press Product Guide, available from:

<http://lenovopress.com/tips1164>

I/O expansion options

The x240 M5 has two I/O expansion connectors for attaching I/O adapter cards. There is a third expansion connector that is designed to connect an expansion node, such as the PCIe Expansion Node. The I/O expansion connectors are a high-density, 216-pin PCIe connector. Installing I/O adapter cards allows the server to connect with switch modules in the Flex System Enterprise Chassis. Each slot has a PCI Express 3.0 x16 host interface and both slots support the same form-factor adapters.

The following figure shows the location of the I/O expansion connectors.

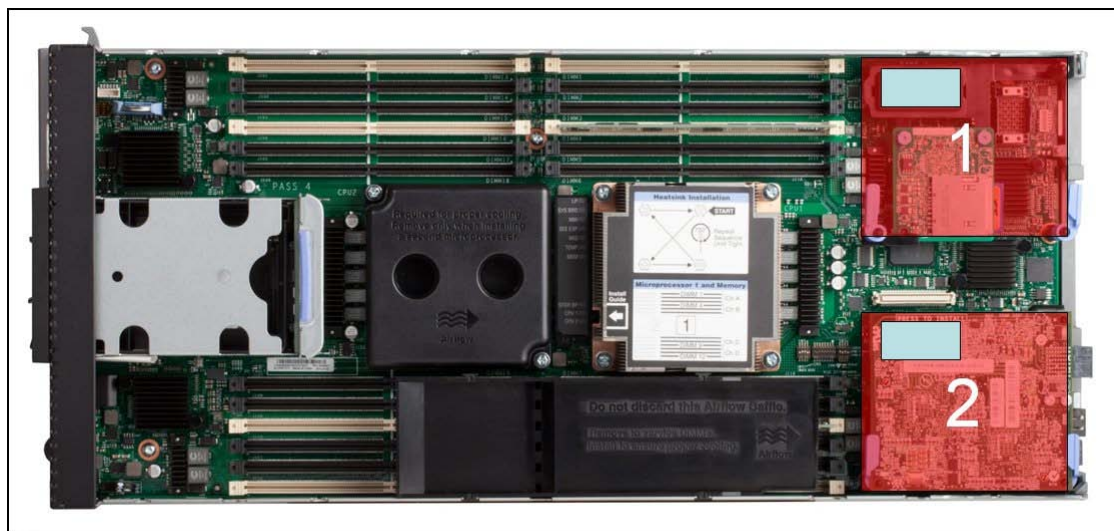


Figure 7. Location of the I/O adapter slots in the Flex System x240 M5 Compute Node

All I/O adapters are the same shape and can be used in any available slot.. A compatible switch or pass-through module must be installed in the corresponding I/O bays in the chassis, as indicated in the following table. Installing two switches means that all ports of the adapter are enabled, which improves performance and network availability.

Table 14. Adapter to I/O bay correspondence

I/O adapter slot in the server	Port on the adapter	Corresponding I/O module bay in the chassis
Slot 1	Port 1	Module bay 1
	Port 2	Module bay 2
	Port 3 (for 4-port cards)	Module bay 1
	Port 4 (for 4-port cards)	Module bay 2
Slot 2	Port 1	Module bay 3
	Port 2	Module bay 4
	Port 3 (for 4-port cards)	Module bay 3
	Port 4 (for 4-port cards)	Module bay 4

The following figure shows the location of the switch bays in the Flex System Enterprise Chassis.

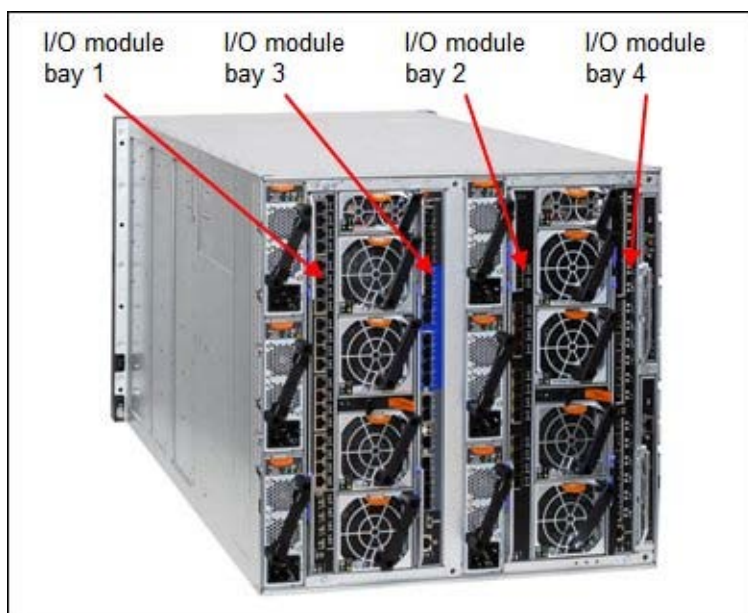


Figure 8. Location of the switch bays in the Flex System Enterprise Chassis

The following figure shows how two-port adapters are connected to switches that are installed in the chassis.

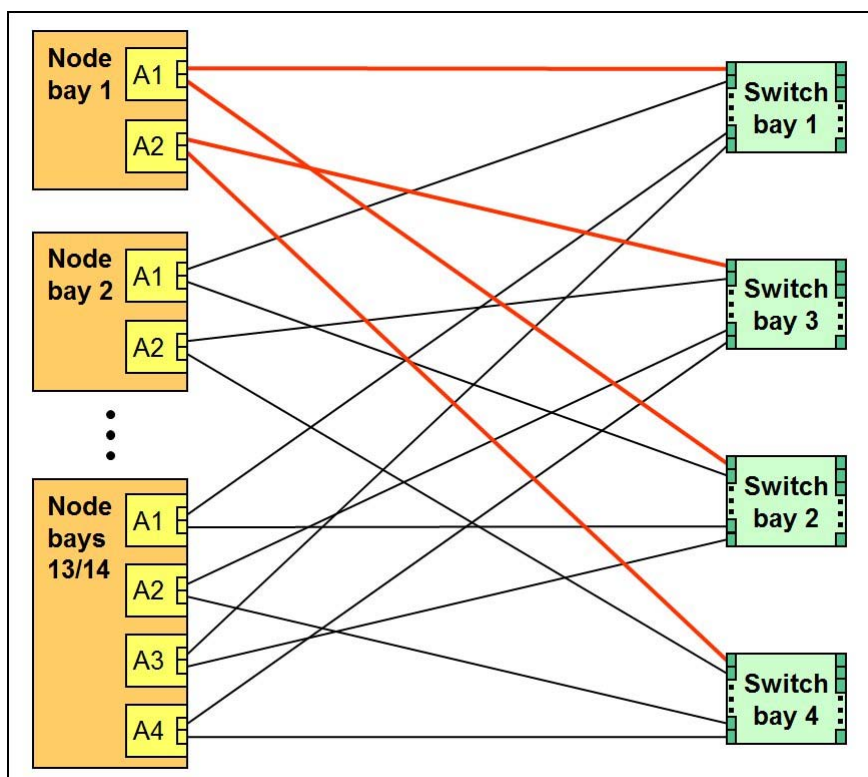


Figure 9. Logical layout of the interconnects between I/O adapters and I/O modules

Flex System PCIe Expansion Node

The x240 M5 supports the attachment of the Flex System PCIe Expansion Node. By using the Flex System PCIe Expansion Node, more PCI Express cards can be attached, such as High IOPS SSD adapters, fabric mezzanine cards, and next-generation graphics processing units (GPU) to supported Flex System compute nodes. This capability is ideal for many applications that require high performance I/O, special telecommunications network interfaces, or hardware acceleration that uses a PCI Express card. The PCIe Expansion Node supports up to four PCIe 2.0 adapters and two more Flex System expansion adapters.

The PCIe Expansion Node is attached to a Flex System compute node, as shown in the following figure.



Figure 10. PCIe Expansion Node attached to the x240 M5

The ordering information for the PCIe Expansion Node is shown in the following table.

Table 15. Ordering part number and feature code

Part number	Feature code	Description	Maximum supported
81Y8983	A1BV	Flex System PCIe Expansion Node	1

The PCIe Expansion Node has the following features:

- Support for up to four standard PCIe 2.0 adapters:
 - Two PCIe 2.0 x16 slots that support full-length, full-height adapters
 - Two PCIe 2.0 x8 slots that support half-length, low-profile adapters
- Support for PCIe 3.0 adapters by operating them in PCIe 2.0 mode
- Support for one full-length, full-height double-wide adapter (that uses the space of the two full-length, full-height adapter slots)
- Support for PCIe cards with higher power requirements; a single adapter card (up to 225W) or to two adapters (up to 150W each)
- Two Flex System I/O expansion connectors to further expand the I/O capability of the attached compute node

Note: The use of the PCIe Expansion Node requires that the x240 M5 Compute Node have both processors installed.

For more information, see the Lenovo Press Product Guide: <http://lenovopress.com/tips0906>

Network adapters

The following table lists the supported network adapters and upgrades. Adapters can be installed in either slot. However, compatible switches must be installed in the corresponding bays of the chassis. All adapters can also be installed in the PCIe Expansion Node. The "Maximum supported" column in the table indicates the number of adapter that can be installed in the server and in the PCIe Expansion Node (PEN).

Table 16. Network adapters

Part number	Feature code	Description	Number of ports	Maximum supported (x240 M5* / PEN)
40 Gb Ethernet				
90Y3482	A3HK	Flex System EN6132 2-port 40Gb Ethernet Adapter	2	2 / None
10 Gb Ethernet				
88Y5920	A4K3	Flex System CN4022 2-port 10Gb Converged Adapter	2	2 / 2
00JY800	A5RP	Flex System CN4052 2-port 10Gb Virtual Fabric Adapter	2	2 / 2
00JY804	A5RV	Flex System CN4052 Virtual Fabric Adapter SW Upgrade (FoD) (License to enable FCoE and iSCSI on 00JY800)	License	2 / 2
00Y3306	A4K2	Flex System CN4054R 10Gb Virtual Fabric Adapters	4	2 / 2
90Y3558	A1R0	Flex System CN4054 Virtual Fabric Adapter (SW Upgrade) (License to enable FCoE and iSCSI on 00Y3306)	License	2 / 2
94Y5160	A4R6	Flex System CN4058S 8-port 10Gb Virtual Fabric Adapter	8	2 / 2
94Y5164	A4R9	Flex System CN4058S Virtual Fabric Adapter SW Upgrade (FoD) (License to enable FCoE and iSCSI on 94Y5160)	License	2 / 2
90Y3466	A1QY	Flex System EN4132 2-port 10Gb Ethernet Adapter	2	2 / 2
00AG530	A5RN	Flex System EN4172 2-port 10Gb Ethernet Adapter	2	2 / 2
1 Gb Ethernet				
49Y7900	A10Y	Flex System EN2024 4-port 1 Gb Ethernet Adapter	4	2 / 2
InfiniBand				
90Y3454	A1QZ	Flex System IB6132 2-port FDR InfiniBand Adapter	2	2 / 2

* For x4x and x6x models (where an Ethernet adapter is standard in slot 1), only one extra adapter can be installed in the compute node.

For more information about adapter-to-switch compatibility, see the Flex System Interoperability Guide, which is available at this web page:

<http://lenovopress.com/fsig>

Storage host bus adapters

The following table lists storage HBAs that are supported by the x240 M5 server, both internally in the compute node and in the PCIe Expansion Node.

Table 17. Storage adapters

Part number	Feature code	Description	Number of ports	Maximum supported (x240 M5* / PEN)
Fibre Channel				
88Y6370	A1BP	Flex System FC5022 2-port 16Gb FC Adapter	2	2 / 2
95Y2386	A45R	Flex System FC5052 2-port 16Gb FC Adapter	2	2 / 2
95Y2391	A45S	Flex System FC5054 4-port 16Gb FC Adapter	4	2 / 2
69Y1942	A1BQ	Flex System FC5172 2-port 16Gb FC Adapter	2	2 / 2
69Y1938	A1BM	Flex System FC3172 2-port 8Gb FC Adapter	2	2 / 2
95Y2375	A2N5	Flex System FC3052 2-port 8Gb FC Adapter	2	2 / 2

* For x4x and x6x models (where an Ethernet adapter is standard in slot 1), only one extra adapter can be installed in the compute node.

For more information about adapter-to-switch compatibility, see the Flex System Interoperability Guide, which is available at this web page:

<http://lenovopress.com/fsig>

PCIe SSD adapters

The compute node supports the High IOPS SSD adapters that are listed in the following table. These adapters are installed in an attached PCIe Expansion Node.

Table 18. SSD adapters

Part number	Feature code	Description	Maximum supported
46C9078	A3J3	365GB High IOPS MLC Mono Adapter (low-profile adapter)	4
46C9081	A3J4	785GB High IOPS MLC Mono Adapter (low-profile adapter)	4
90Y4377	A3DY	1.2TB High IOPS MLC Mono Adapter (low-profile adapter)	2
90Y4397	A3DZ	2.4TB High IOPS MLC Duo Adapter (full-height adapter)	2
00AE983	ARYK	1250GB Enterprise Value io3 Flash Adapter for System x	2
00AE986	ARYL	1600GB Enterprise Value io3 Flash Adapter for System x	2
00AE989	ARYM	3200GB Enterprise Value io3 Flash Adapter for System x	2
00AE992	ARYN	6400GB Enterprise Value io3 Flash Adapter for System x	2
00AE995	ARYP	1000GB Enterprise io3 Flash Adapter for System x	2
00AE998	ARYQ	1300GB Enterprise io3 Flash Adapter for System x	2
00JY001	ARYR	2600GB Enterprise io3 Flash Adapter for System x	2
00JY004	ARYS	5200GB Enterprise io3 Flash Adapter for System x	2

For more information about these adapters, see the Lenovo Press Product Guide for the High IOPS MLC Adapters, which is available at this web page:

<http://lenovopress.com/tips0907>

GPU adapters

The compute node supports the GPU adapters that are listed in the following table.

Note: These adapters are installed in an attached PCIe Expansion Node.

Table 19. GPU adapters

Part number	Feature code	Description	Maximum supported
94Y5960	A1R4	NVIDIA Tesla M2090 (full-height adapter)	1*‡
47C2119	A4F3	NVIDIA Tesla K20 for Flex System PCIe Expansion Node	1†‡
47C2137	A5HD	NVIDIA Tesla K40 for Flex System PCIe Expansion Node	1†‡
47C2122	A4F4	Intel Xeon Phi 5110P for Flex System PCIe Expansion Node	1†‡

* If the NVIDIA Tesla M2090 is installed in the Expansion Node, then an adapter cannot be installed in the other full-height slot. If installed, only this adapter is supported in the expansion node. No other PCIe adapters may be selected.

† The K1, K2, K20, K40 and 5110P adapters are double-wide cards and occupy the two full-height PCIe slots. If installed, the adjacent slot is unavailable, however adapters can be installed in the two low-profile slots.

‡ NVIDIA GRID Kx and Tesla Kxx GPUs supported only when the x240 M5 has 1 TB or less memory installed.

Power supplies

Server power is derived from the power supplies that are installed in the chassis. There are no server options regarding power supplies.

Integrated virtualization

The x240 M5 supports the VMware vSphere (ESXi) hypervisor on one or two SD cards with the optional SD Media Adapter for System x. This adapter is installed in a dedicated slot under I/O Adapter slot 1, as shown in the following figure.



Figure 11. SD Media Adapter for System x

When only one SD card is installed in the adapter, you can create up to 16 volumes, each of which is presented to UEFI as a bootable device. When two SD Media cards are inserted, volumes can be mirrored (RAID 1) across both cards, up to a total of eight mirrored volumes. The use of mirrored volumes improves system availability because the server remains operational, even if one SD card fails. The RAID functionality is handled internally by the SD Media Adapter.

The following table shows the available options. The table also indicates whether the option includes the SD Media RAID Adapter and how many SD cards are included.

Table 20. Virtualization options

Part number	Feature code	Description	Includes Adapter	Includes Media
00ML706	A5TJ	SD Media Adapter for Systems x (Option 00ML706 includes 2 blank 32GB SD cards)	Yes	Yes (2)*
00ML700	AS2V	Blank 32GB SD Media for System x	No	Yes (1)
None**	AS4B	RAID Adapter for SD Media w/ VMware ESXi 5.1 U2 (2 SD Media, RAIDed)	Yes	Yes (2)
None**	AS4C	RAID Adapter for SD Media w/ VMware ESXi 5.5 U2 (2 SD Media, RAIDed)	Yes	Yes (2)
None**	ASCG	RAID Adapter for SD Media w/ VMware ESXi 5.1 U2 (1 SD Media)	Yes	Yes (1)
None**	ASCH	RAID Adapter for SD Media w/ VMware ESXi 5.5 U2 (1 SD Media)	Yes	Yes (1)

* Option 00ML706 includes two 32GB SD cards; however, for CTO orders, feature code A5TJ does not include SD media and the 32GB cards and VMware vSphere preload must be selected separately.

** CTO only.

Light path diagnostics

For quick problem determination when it is physically at the server, the x240 M5 offers the following three-step guided path:

1. The Fault LED on the front panel.
2. The light path diagnostics panel, as shown in the following figure.
3. LEDs next to key components on the system board.

The x240 M5 light path diagnostics panel is inside the server between the two processors, as shown in the following figure.

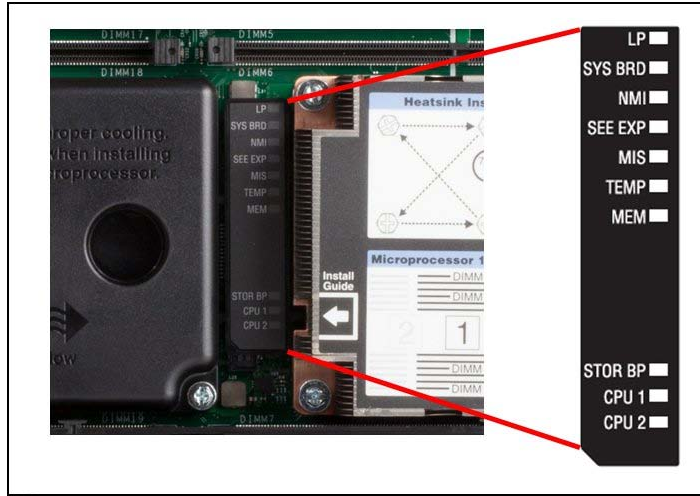


Figure 12. Location of x240 M5 light path diagnostics panel

To illuminate the light path diagnostics LEDs, power off the compute node, slide it out of the chassis, and press the power button. The power button doubles as the light path diagnostics reminder button when the server is removed from the chassis.

The meanings of the LEDs in the light path diagnostics panel are listed in the following table.

Table 21. Light path diagnostic panel LEDs

LED	Meaning
LP	The light path diagnostics panel is operational.
SYS BRD	A system board error is detected.
NMI	A non-maskable interrupt (NMI) occurred.
SEE EXP	A fault is detected in the adjacent expansion unit (if installed).
MIS	A mismatch occurred between the processors, DIMMs, or HDDs within the configuration as reported by POST.
TEMP	An over-temperature condition occurred that was critical enough to shut down the server.
MEM	A memory fault occurred. The corresponding DIMM error LEDs on the system board are also lit.

Remote management

The server contains an Integrated Management Module II (IMM2), which interfaces with the advanced management module in the chassis. The combination of these modules provides advanced service-processor control, monitoring, and an alerting function. If an environmental condition exceeds a threshold or if a system component fails, LEDs on the system board are lit to help you diagnose the problem, the error is recorded in the event log, and you are alerted to the problem. A virtual presence capability comes standard for remote server management.

Remote server management is provided through the following industry-standard interfaces:

- Intelligent Platform Management Interface (IPMI) Version 2.0
- Simple Network Management Protocol (SNMP) Version 3
- Common Information Model (CIM)
- Web browser

The server also supports virtual media and remote control features, which provide the following functions:

- Remotely viewing video with graphics resolutions up to 1600x1200 at 75 Hz with up to 23 bits per pixel, regardless of the system state.
- Remotely accessing the server by using the keyboard and mouse from a remote client.
- Mapping the CD or DVD drive, diskette drive, and USB flash drive on a remote client, and mapping ISO and diskette image files as virtual drives that are available for use by the server.
- Uploading a diskette image to the IMM2 memory and mapping it to the server as a virtual drive.
- Capturing blue-screen errors.

Supported operating systems

The server supports the following operating systems:

- Microsoft Windows Server 2012
- Microsoft Windows Server 2012 R2
- Red Hat Enterprise Linux 6 Server x64 Edition
- Red Hat Enterprise Linux 7
- SUSE LINUX Enterprise Server 11 for AMD64/EM64T
- SUSE LINUX Enterprise Server 11 with Xen for AMD64/EM64T
- VMware vSphere 5.1 (ESXi)
- VMware vSphere 5.5 (ESXi)

Note: Support by some of these operating system versions is available after the date of initial availability. For more information about the specific versions and service levels that are supported and any other prerequisites, see the following ServerProven® website:

<http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/nos/matrix.shtml>

Physical specifications

The server features the following dimensions and weight (approximate):

- Height: 51 mm (2.0 in)
- Depth: 493 mm (19.4 in)
- Width: 215 mm (8.5 in)
- Maximum weight: 7.1 kg (15.6 lb)

The server features the following shipping dimensions and weight (approximate):

- Height: 197 mm (7.8 in)
- Depth: 603 mm (23.7 in)
- Width: 430 mm (16.9 in)
- Weight: 8 kg (17.6 lb)

Supported environment

The Flex System x240 M5 compute node complies with ASHRAE Class A3 specifications.

The following Power on operating environment is supported:

- Temperature: 5 - 40 °C (41 - 104 °F)
- Humidity, non-condensing: -12 °C dew point (10.4 °F) and 8 - 85% relative humidity
- Maximum dew point: 24 °C (75 °F)
- Maximum altitude: 3048 m (10,000 ft)
- Maximum rate of temperature change: 5 °C/hr (41 °F/hr)

The following Power off operating environment is supported:

- Temperature: 5 - 45 °C (41 - 113 °F)
- Relative humidity: 8 - 85%
- Maximum dew point: 27 °C (80.6 °F)

The following Storage (non-operating) operating environment is supported:

- Temperature: 1 - 60 °C (33.8 - 140 °F)
- Altitude: 3050 m (10,006 ft)
- Relative humidity: 5 - 80%
- Maximum dew point: 29 °C (84.2 °F)

The following Shipment (non-operating) environment is supported:

- Temperature: -40 - 60 °C (-40 - 140 °F)
- Altitude: 10,700 m (35,105 ft)
- Relative humidity: 5 - 100%
- Maximum dew point: 29 °C (84.2 °F)

Warranty options

The Flex System x240 M5 Compute Node has a three-year on-site warranty with 9x5 next-business-day terms. Lenovo offers the service upgrades through Lenovo Services warranty maintenance upgrades and post-warranty maintenance agreements with a well-defined scope of services, including service hours, response time, term of service, and service agreement terms and conditions.

Lenovo warranty service upgrade offerings are country-specific; that is, each country might have its own service types, service levels, response times, and terms and conditions. Not all covered types of warranty service upgrades might be available in a particular country or area. For more information about Lenovo warranty service upgrade offerings that are available in your country, visit the Lenovo Services website:

<https://www-304.ibm.com/sales/gss/download/spst/servicepac/extProductSelectorWWW.do>

The following table explains warranty service definitions in more detail.

Table 22. Warranty service definitions

Term	Description
On-site repair	A service technician will come to the server's location for equipment repair.
24x7x2 hour	A service technician is scheduled to arrive at the client's location within four hours after remote problem determination is completed. Lenovo provides service around the clock, every day, including Lenovo holidays.
24x7x4 hour	A service technician is scheduled to arrive at the client's location within eight hours after remote problem determination is completed. Lenovo provides service around the clock, every day, including Lenovo holidays.
9x5x4 hour	A service technician is scheduled to arrive at the client's location within four business hours after remote problem determination is completed. Lenovo provides service 8:00 a.m. - 5:00 p.m. in the client's local time zone, Monday - Friday, excluding Lenovo holidays.
9x5 next business day	A service technician is scheduled to arrive at the client's location on the business day after Lenovo receives your call, following remote problem determination. Lenovo provides service 8:00 a.m. - 5:00 p.m. in the client's local time zone, Monday - Friday, excluding Lenovo holidays. Calls received after 4:00pm local time require an extra business day for service dispatch. Next business day service is not guaranteed.

The following types of Lenovo warranty service upgrades are available:

- Warranty and maintenance service upgrades:
 - Three, four, or five years of 9x5 or 24x7 service coverage
 - Onsite repair from next business day to 8 or 4 hours
 - One or two years of warranty extension
- Priority technical support

Lenovo's Priority Support Offering enhances our award-winning call center support to provide top priority queue assignment to specialized Lenovo technicians. Priority support accelerates call center troubleshooting to get your problems resolved quickly, and includes other value added support for Lenovo provided software tools. Priority support can be purchased stand-alone to match the base warranty of your system or in convenient bundles with our same-day response services.

- **Keep Your Drive Multi-Drive**

Lenovo's Keep Your Drive Multi-Drive service is a multi-drive hard drive retention offering that ensures your data is always under your control, regardless of the number of hard drives that are installed in your Lenovo server. In the unlikely event of a hard drive failure, you retain possession of your hard drive while Lenovo replaces the failed drive part. Your data stays safely on your premises, in your hands. Keep Your Drive Multi-Drive can be purchased stand-alone to match the base warranty of your system or in convenient bundles with our same-day response services.

Regulatory compliance

The server conforms to the following standards:

- ASHRAE Class A3
- FCC - Verified to comply with Part 15 of the FCC Rules Class A
- Canada ICES-004, issue 3 Class A
- UL/IEC 60950-1
- CSA C22.2 No. 60950-1
- Japan VCCI, Class A
- IEC 60950-1 (CB Certificate and CB Test Report)
- Taiwan BSMI CNS13438, Class A; CNS14336
- Australia/New Zealand AS/NZS CISPR 22, Class A
- Korea KN22, Class A, KN24
- IEC 60950-1 (CB Certificate and CB Test Report)
- CE Mark (EN55022 Class A, EN60950-1, EN55024, EN61000-3-2, EN61000-3-3)
- TUV-GS (EN60950-1/IEC 60950-1, EK1-ITB2000)

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We work with businesses, non-profit organizations, governments and educational institutions to finance their entire technology solution. We focus on making it easy to do business with us. Our highly experienced team of finance professionals operates in a work culture that emphasizes the importance of providing outstanding customer service. Our systems, processes and flexible policies support our goal of providing customers with a positive experience.

We finance your entire solution. Unlike others, we allow you to bundle everything you need from hardware and software to service contracts, installation costs, training fees, and sales tax. If you decide weeks or months later to add to your solution, we can consolidate everything into a single invoice.

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For your region specific offers please ask your Lenovo sales representative or your technology provider about the use of Lenovo Financial Services. For more information, see the following Lenovo website: http://www.lenovo.com/services_warranty/us/en/financial_services.html

Related publications and links

For more information, see the following resources:

- Lenovo Press Product Guides for Flex System servers and options
<http://lenovopress.com/flexsystem>
- US Announcement Letter
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS114-140>
- Flex System x240 M5 Compute Node product page
http://ibm.com/systems/flex/compute-node/x86/bto/x240_m5/
- Flex System Information Center
<http://publib.boulder.ibm.com/infocenter/flexsys/information/index.jsp>
- Flex System x240 M5 Compute Node Installation and Service Guide
http://pic.dhe.ibm.com/infocenter/flexsys/information/topic/com.lenovo.acc.9532.doc/printable_doc.html
- ServerProven for Flex System
<http://ibm.com/systems/info/x86servers/serverproven/compat/us/flexsystems.html>
- ServerProven hardware compatibility page for the x240 M5
<http://ibm.com/systems/info/x86servers/serverproven/compat/us/flex/9532.html>
- ServerProven compatibility page for operating system support
<http://ibm.com/systems/info/x86servers/serverproven/compat/us/nos/flexmatrix.shtml>
- Flex System Interoperability Guide
<http://lenovopress.com/fsig>
- Configuration and Option Guide
<http://www.ibm.com/systems/xbc/cog/>
- xREF - System x Reference
<http://lenovopress.com/xref>
- System x Support Portal
<http://ibm.com/support/entry/portal/>
- IBM System Storage® Interoperation Center
<http://www.ibm.com/systems/support/storage/ssic>

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